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EFFECT OF DIFFERENT LEVELS OF NPK ON GROWTH, YIELD AND ECONOMIC OF CAPSICUM (*CAPSICUM ANNUUM L.*) CV. ASHA UNDER SHADE NET HOUSE CULTIVATION

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ABSTRACT

Capsicum cultivation can contribute in raising the country economy pattern. Effect of different levels of NPK on growth, yield and economic of capsicum var. Asha under shade net house was evaluated. The experiment was laid in randomized block design with three replications. Among the treatments combination, application of N: P: K @150:120:60 kg/ha proved better to improve both growth and yield traits than other treatment combinations by revealing maximum average plant height (60.10 cm), average stem girth (4.08 cm), number of primary branches (3.40),number of secondary branches (6.24), days of 50% flowering appearance (35.20), average fruit weight (125.60 g) number of fruits/ plant (9.40), yield / plot (8.82 kg) and yield/ ha (29.41t/ ha). Cultivation of capsicum under sub-tropical condition with an application of N: P: K @ 150:120:60 kg/ha revealed maximum B: C ratio of 4.70:1.

KEYWORDS: Capsicum, Economics, Growth, Yield, NPK and Shade Net House

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INTRODUCTION

Capsicum (*Capsicum annuum* L.) also known as bell pepper or shimla mirch, is one of the most popular and highly valued vegetable crop grown in tropical and sub tropical parts of world. It is one of the highly demand crop and occupies a place of pride among vegetable, because of its delicacy and pleasant flavour coupled with rich content of ascorbic acid and other vitamins and minerals. Capsicum can be grown up to sea-levels of 3,000 M in the tropics, preferably with a rainfall of 600 -1200 mm. It is sensitive to water logging and excessive rain and thrives best in relatively warm climate with a temperature range of 18-27^0 C. A sandy loam soil which holds moisture fairly well with pH level of 6-7 is ideal for growth of Capsicum crop. Capsicum production has already proved an enormously successful venture in countries like Japan, China and South Korea. Attention is now being paid to explore its potential in India, for earning foreign exchange besides higher economic returns to the farmers. Capsicum fetches high price in market, mainly due to heavy demand from urban consumers. There is a good demand for export also. The export market needs fruits with longer shelf life, medium size tetra-lobed fruits with attractive colour, mild pungency with good taste. Despite its economic importance, growers are not in a position to produce good quality capsicum due to adverse climatic condition under open fields. Hence, to increase productivity of good quality produce and to fulfill the export standards, there is need to cultivate capsicum under protected structures such as shade net houses. In addition to this low fertility status of soil has been advanced as

one of the serious factor. Maintenance of soil fertility has been established as a prerequisite for sustainable crop production and increase yield while NPK has been reported to play a vital role in this regard. Growth and yield of capsicum are greatly affected by different levels of NPK fertilizer application. Therefore, it is imminent need to assess the optimum levels of NPK for its cultivation in controlled condition. Hence the present study was undertaken with aims to evaluate the impact of different levels of NPK on growth, yield and economic of capsicum under shade net house.

MATERIALS AND METHODS

The present study was carried out during 2013-2014 at vegetable research farm of Sam Higginbottom Institute of Agriculture, Technology and Science, Allahabad, U.P. The soil selected for the experiment was medium black with good texture with pH of 5.5-6. The shade net used for the experiment was galvanized steel pipe framed structure, 25m length and 10 m breadth (250 m^2) facing north to south direction, covered with perforated green nylon net which had capacity to allow only 50% of light inside. The experiment was laid out in Randomized Block Design (RBD) with nine treatments and three replication at a spacing of 60×30 cm. Different treatments of NPK were T_0 (Control), T_1 (150-75-60 NPK kg/ ha), T_2 (90-75-60 NPK kg/ ha), T_3 (250-75-60 NPK kg/ ha), T_4 (150-50-60 NPK kg/ ha), T_5 (150-120-60 NPK kg/ ha), T_6 (150-75-50 NPK kg/ ha), T_7 (150-75-120 NPK kg/ ha), T_8 (180-80-80 NPK kg/ ha). Healthy and uniform seedlings of 15 days old were transplanted in first week of October in raised plot size of 3m^2 under shade net house. NPK were given in the form of urea, di-ammonium phosphate and murate of potash. Nitrogen was given in split doses. First half dose of nitrogen was applied as basal dose at the time of transplanting, while the remaining dose was applied after 45 and 60 days after transplanting (DAT). Full dose of P and K were applied at the time of transplanting. All cultural practices i.e., irrigation, hoeing and weeding were carried out throughout the growing season as recommended. Data were collected from randomly selected five plant from each plot as average plant height, average stem girth (cm), number of primary branches, number of secondary branches, days of 50% flower appearance, average fruit weight (g), number of fruits/plant, yield/plot (kg) and fruit yield/ha (t), was recorded and statistically analyzed following methodology suggested by (Panse and Sukhatme, 1989). Critical differences of P=0.05 were calculated wherever the 'F' test was found significant. Economics was worked out on the basis of input and output as per existing market price.

RESULTS AND DISCUSSIONS

Effect of NPK on Growth Parameters under Shade Net Condition

There was a significant effect of various treatments on average plant height, average stem girth, number of primary branches, number of secondary branches and days of 50% flower appearance as presented in Table 1. Treatment T_5 (NPK 150:120:60 kg/ha) recorded the average maximum plant height (60.1 cm), average stem girth (4.08cm), number of primary branches (3.40),number of secondary branches (6.24) and days of 50% flower appearance (35.20) followed by T_1 and lowest was found on control (T_0). Incremental advances in growth parameters were observed with the increase in dosage of chemical fertilizers. This might be due to optimum nutrient supply provided to plant, enhancing the growth and development by increasing the rate of plant metabolic processes like photosynthesis, respiration and their better acclimatization that encouraged greater green leaf area helping in higher carbohydrate synthesis lead to increase formation of plant metabolites that helped to build the plant tissue. Similar results were reported by (Hazarika and Phookan 2005) in Tomato, (Malik et al., 2011) in capsicum, (Harikrishna *et al*., 2002) in Tomato, (Magray, 2002) in capsicum.

Effect of NPK on Yield Parameters of Capsicum CV Asha under Shade Net Condition

Statistically significant results were observed for average fruit weight, number of fruits/ plant, yield/ plot and fruit yield/ ha (t) affected by different levels of NPK, as shown in Table 2. Treatment T_5 (NPK 150:120: 60 kg/ha) recorded highest average fruit weight (125.60 g), highest number of fruits/ plant (9.40), yield/plot (8.82 kg) and yield/ha (29.41/ha). Application of higher dose of chemical fertilizer in the experimental plots gave a very positive impetus on yield parameters by increasing the number of pickings in Capsicum whereas lowest was found on control (T_0). This might be due to abundant availability of nutrients that increase vegetative growth and balanced C/N ratio and accelerated the synthesis of carbohydrates and its better translocation from sink to source resulting in higher yield. These results were in line with findings of (Malik *et al*.,2011) in capsicum, (Magray, 2002) in capsicum and (Hiremath *et al*.,2006) in capsicum.

Economic

The economics of different treatments were worked out in terms of cost of cultivation (Rs/ ha), gross return (Rs/ ha), net return (Rs/ ha) and benefit cost ratio. Table 3 reveals that the net return can be up to the tune of Rs 46, 32,118.85/ ha. The remunerative returns can have a very fruitful impact on the poor farming community. Maximum benefit cost ratio of 4.70: 1 was observed in T_5. The exploitive agriculture for centuries has brought the fertility status of our soils to a level from where for any further increase in the yield cannot be relied upon the native soil fertility. As such, in future, gains in production levels will accrue through enhancement of productivity which will necessarily mean increased demand on soil fertility. There will be huge demand of nutrient for enriching the soils though chemical fertilizers would continue to play pivotal role in the enrichment of soils and subsequently the production level of crops.

CONCLUSIONS

Capsicum yield was generally increased with the higher dose of phosphorus, thus cultivation of capsicum cv. Asha with NPK 150:120:60 shown superiority in terms of growth, yield and economic returns under shade net house conditions. Optimum nutrient input will give a positive impetus to the capsicum cultivation which in turn shall be very fruitful to encourage the livelihood security of poor farming community.

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APPENDICES

Table 1: Effect of NPK on Growth Parameters of Capsicum CV Asha under Shade Net Condition

Treatment	Treatment Combination	Average Plant Hight (Cm)	Average Stem Girth (Cm)	No. of Primary Branches	No. of Secondary Branches	Days of 50% Flower Appearance
T_0	Control	44.96	1.75	1.40	3.82	47.20
T_1	NPK 150:75:60	56.72	3.82	2.60	5.94	37.40
T_2	NPK 90:75:60	52.61	2.55	1.74	4.42	42.20
T_3	NPK 250:75:60	55.61	3.15	1.82	5.76	38.20
T_4	NPK 150:50:60	54.13	2.75	1.80	5.66	40.20
T_5	NPK 150:120:60	60.10	4.08	3.40	6.24	35.20
T_6	NPK 150:75:50	56.08	3.39	1.92	5.82	39.20
T_7	NPK 150:75:120	55.10	2.90	2.00	5.72	41.20
T_8	NPK 180:80:80	57.41	3.89	3.00	6.10	36.20
S.Ed (±)		0.22	0.29	0.14	0.06	0.23
C.D. (5%)		0.47	0.63	0.29	0.12	0.49

Table 2: Effect of NPK on Yield Parameters of Capsicum CV Asha under Shade Net Condition

Treatment	Treatment Combination	No.of Fruits/plant	Fruit Yield/plant (kg)	Yield/plot (kg)	Yield /ha (t)
T_0	Control	4.53	0.38	3.02	10.09
T_1	NPK 150:75:60	8.20	0.92	7.38	24.62
T_2	NPK 90:75:60	5.20	0.47	3.75	12.52
T_3	NPK 250:75:60	6.27	0.63	5.03	16.78
T_4	NPK 150:50:60	5.53	0.59	4.70	15.69
T_5	NPK 150:120:60	9.40	1.10	8.82	29.41
T_6	NPK 150:75:50	6.60	0.63	5.03	16.80
T_7	NPK 150:75:120	7.53	0.95	7.56	25.22
T_8	NPK 180:80:80	8.80	1.02	8.20	27.34
S.Ed(±)		0.21	0.35	0.08	0.26
C.D (5%)		0.45	0.75	0.16	0.56

Table 3: Economics of Different Treatments of Capsicum CV Asha under Shade Net Cultivation

Treatment	Treatments Combination	Fruit Yield/ ha (kg)	Sale Rate Rs/kg	Total Cost of Cultivation (Rs.)	Gross Return Rs./ ha	Net Return Rs./ ha	Benefit Cost Ratio
T_0	Control	10090	200	12,416,83.33	20,180,00	7,763,16.67	1.62:1
T_1	NPK 150:75:60	24620	200	12,487,87.98	49,240,00	36,752,12.02	3.94:1
T_2	NPK 90:75:60	12520	200	12,478,74.97	25,040,00	12,561,25.03	2.00:1
T_3	NPK 250:75:60	16780	200	12,503,09.71	33,560,00	21,056,90.29	2.68:1
T_4	NPK 150:50:60	15690	200	12,476,80.41	31,380,00	18,903,19.59	2.51:1
T_5	NPK 150:120:60	29410	200	12,507,81.15	58,820,00	46,312,18.85	4.70:1
T_6	NPK 150:75:50	16800	200	12,485,37.93	33,600,00	21,114,62.07	2.69:1
T_7	NPK 150:75:120	25220	200	12,502,87.98	50,440,00	37,937,12.02	4.03:1
T_8	NPK 180:80:80	27340	200	12,499,65.68	54,680,00	42,180,34.32	4.37:1